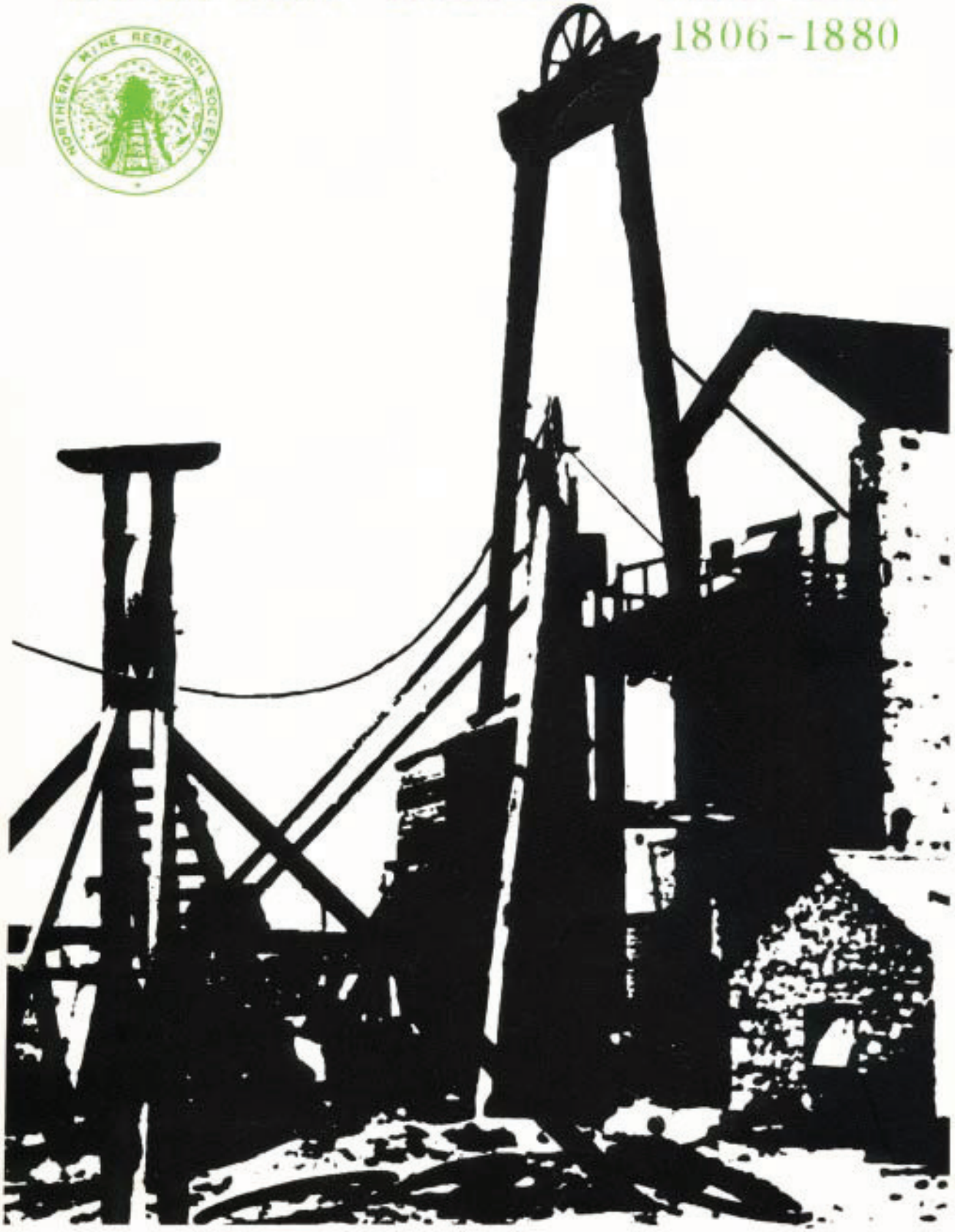
British Mining No. 15.

THE TEIGN VALLEY SILVER-LEAD MINES

1806-1880



C.J. Schmitz.

ISSN 0308-21 99
ISBN 0 901450 18 9

BRITISH MINING No.15

THE TEIGN VALLEY SILVER-LEAD MINES 1806-1880.

Christopher J. Schmitz.

A MONOGRAPH OF THE NORTHERN MINE RESEARCH SOCIETY
1980.

First impression: 1973 Published as Northern Cavern and Mine Research Society Occasional Publication No.6.

Second impression: 1980 Revised and published as Northern Mine Research Society British Mining No.15.

NB
This publication was originally issued in the A4 format then used by the society. It has now been digitised and reformatted at A5. This has changed the original pagination, which is given in square brackets.

CONTENTS

LIST OF ILLUSTRATIONS

(All photographs taken by author in 1971-72)

PREFACE TO THE SECOND EDITION

Metal mining in the county of Devonshire is an industry with a history which stretches back as far as that in perhaps any area of Britain. Its heyday came in the early and mid-nineteenth century, with upwards of two hundred mines producing ores of copper, lead, silver, zinc, tin, tungsten, arsenic, iron and manganese, but the origins of the industry can be traced back long before then. Together with the neighbouring county of Cornwall, Devon produced the bulk of Europe's tin supplies until the seventeenth century, from its alluvial workings and shallow mines on Dartmoor. During the reign of Edward I the silver mines of Combe Martin and Beer Alston provided large amounts of bullion for the Royal purse. Once again these mines became an important source of Royal finance when, during the English Civil War, Charles I received silver from the Devon mines. By the twentieth century most mining activity had come to an end in the county; the only working mines surviving into the second half of the century being the Bridford barytes mine (ceased operations 1958) and the Great Rock iron mine at Hennock (closed 1969). Currently, it seems that there are plans to re-work the old Hemerdon tin-tungsten-kaolin deposit, to the north-east of Plymouth, so there may once again be a working mine in the county. In addition, in recent years, there has been sporadic, small-scale activity in the vicinity of Ashburton, on the south-eastern fringe of Dartmoor, where streaming operations have apparently yielded some 20 or 30 tons of tin concentrates a year. Overall however, the recent scale of mining activity can in no way be compared with that of the mid-nineteenth century when (according to the 1861 census) a total of 2,831 persons (male and female) were employed in copper, tin, lead and iron mining. Such activity, with individual mines of different sizes and types being scattered virtually the length and breadth of Devonshire, surely deserves some written history. Yet, when I first approached the subject of Devon mining ten years ago I discovered that with the exception of some work on the copper mining district of Tavistock-Gunnislake, in the west of the county,[1] little had been written of any substance.

This interest in Devon mining grew out of a longer established one in Cornish mining and blossomed after taking up residence in Exeter in 1968. My specific interest in the mines of the Teign Valley, to the east of Dartmoor, arose during late 1969 when it became apparent that I would require a subject for an undergraduate dissertation in the Department of Economic History at the University of Exeter. The first edition of this volume was the outcome of that dissertation research. The Teign Valley was only a short journey from Exeter and there was the added attraction that I could discover little or nothing that had been published on what was once obviously a thriving lead and silver mining area. Field work was difficult, due to loss of much of

the physical remains under the plough. Often entire afternoons were spent following clues to the whereabouts of an old engine-house (probably well documented in the contemporary literature) only to discover a low, crumbling wall almost obliterated by a century's growth of brambles. Nevertheless, after long research in the Exeter City and Devon County Records Offices and even longer searches (aided by numerous friends) in the undergrowth of the Teign Valley, it seemed possible to construct some kind of a picture of the development and decline of the mining industry in this corner of Devon.

In the six years since the first edition of this book was published (and the eight since I wrote the manuscript) there has a been an encouraging flow of published work on the subject. As I noted in a 1975 article: 'There has recently been an upsurge of interest in the history of Devon mining, illustrated not only by a spate of publications on the subject but also by the increasing number of visitors to the mine sites themselves.'[2] There have been numerous articles on Dartmoor tin mining, a short book on the tin and iron mines of the Dartmoor granite area, articles on manganese and barytes mining, together with the first part of a promised two-volume account of the *Mines of Devon*, by A.K. Hamilton-Jenkin, doyen of Cornish mining historians, although unfortunately it is not certain that the second volume will ever be published.[3] This second edition consists of a thorough revision of the original volume, with the addition of new material not available eight years ago. It also corrects some errors that crept into the first edition and includes some new and redrawn maps.

Since writing the original edition I have had a chance to mull over some of the issues which it raised but which were not fully discussed there due to the essentially descriptive nature of the account. The strongest impression was of the fragile nature of mining enterprises in the valley. The life expectancy of mining companies was extremely limited; the most successful, Frank Mills, was in production a mere 24 years and 12 of those were spent in clear decline. Other mines had an even more precarious and ephemeral existence; South Exmouth rose and fell within six years while the impoverished Hennock mine had a succession of short bursts of mining activity, none lasting more than six years. However, this could be said of much mining activity, an industry where the very act of extracting the minerals hastens the inevitable end of a company's life. In the Teign Valley the process of closing one mine to open another was ameliorated to a certain extent due to the interlocking structure of most of the companies. It seems that the major shareholders in Wheal Adams subsequently took interests in Wheal Exmouth, as the latter developed the southerly extension of the Adams lodes, and in turn the Exmouth shareholders (or 'adventurers') took the major interest in Frank Mills, which developed the southern extension of the Exmouth lodes at a time when Adams had passed from the mining scene and Exmouth was heading towards decline. Management from one mine often supervised the newer operations; J.O. Harris was purser at Wheal Exmouth, South Exmouth and Frank Mills in the period 1867-80, while J.P. Nicholls was mine 'captain' (manager) at Wheal Exmouth, South Exmouth and Frank Mills in the period 1857 or 1858 to 1868. In addition, it is almost certain that miners and

surface workers would have moved from mine to mine. Thus there would have been a continuity of operations not at first suggested by the short lives of individual mines.

Another point which emerges from the study is the influence that price changes for refined metals can have on mining operations. In at least two cases, that is in 1806 and 1836, unusually high prices for pig lead in national markets stimulated, respectively, what was probably the first serious attempt to mine lead in the Teign Valley, and a spirited revival of mining activity throughout the parishes of Hennock, Christow and Bridford. In later years unusually high prices in the early 1870s (associated with a general trade boom) probably helped keep Frank Mills in operation longer than it might otherwise have done, with its clearly failing ore deposits in depth. Then, just as surely, the catastrophic collapse in lead prices (together with other metal prices) which lasted from 1878 until the mid 1890s, helped ensure the final closure of Frank Mills and with it the end of silver-lead mining in the Teign Valley. A further point about the importance of metal prices to the profitability of the Teign Valley mines relates to the production of silver. At a fairly steady five shillings an ounce, or thereabouts, it contributed in no small way to the viability of mining throughout the period. Frank Mills at times received as much as 30 percent of its entire revenue from sales of the precious metal.

It is now unlikely that there will ever again be any mining in the Teign Valley. Greater awareness about the vulnerability of our environment now, rightly, ensures that any mining proposal is scrutinised closely. More significantly, the economics of the world mining industry now demands large-scale, low-grade ore deposits that can be exploited using capital-intensive technology. In this context the relatively small but high-grade mineral deposits that abounded in nineteenth-century Britain, which required what was then cheap, skilled labour in abundance, can be seen as providing only limited scope for development by today's mining corporations. Nevertheless, the shades of the past often return for a brief moment. During the winter and spring of 1973-74, shortly after the first edition of this book was published, there seemed a possibility that an international mining company was interested in prospecting for barytes deposits in the Teign Valley, particularly around Wheal Exmouth. Barytes is much in demand as the base for a high-density mud used in oil and gas drilling operations and as such demand for this mineral was rising in the early 1970s with the North Sea exploration programme. The Wheal Exmouth proposal came to nothing, however, despite some exploratory prospecting which clearly revealed the existence of some large quantities of barytes.

As in the first edition, I have a debt of gratitude to pay to a number of persons and institutions for aid in the research and writing of this study. These include: Viscount Exmouth of Canonteign, who allowed me to visit his estate and photograph his house (under which the main lodes run), the staffs of the Exeter City and Devon County Records Offices, Professor Walter Minchinton, Dr Roger Burt, Michael Atkinson and Peter Waite, all of the University of Exeter, Robert Nunny, Richard Scrivenor, the late Lt-Col. J.V. Ramsden DSO, AMIMM, FGS, former manager of the

Bridford Barytes Mine, whose researches did much to document many facets of Devon mining history, Tom Greeves, who has been invaluable in pointing to some pieces of information I would otherwise surely have missed, and finally to my wife Janet, who has suffered my sometimes obsessional interest in mining with grace and understanding.

Department of Modern History
University of St Andrews
Scotland
November 1979

Footnotes:

(1) J.C. Goodridge, 'Devon Great Consols: a Study in Victorian Mining Enterprise' *Transactions of the Devonshire Association*, XCVI (1964) pp228-68 and F. Booker, *Industrial Archaeology of the Tamar Valley*, (Newton Abbot: 2nd. ed. 1971).

(2) M. Atkinson and C.J. Schmitz, 'Kelly Iron Mine, near Bovey Tracey' *Devon Historian*, XI (1975) p27.

(3) See, T.A.P. Greeves, 'A Mine in the Deancombe Valley' Trans. *Devon. Assoc.*, Cl (1969) pp197-201; R.M.L. Cook, T.A.P. Greeves and C.C. Kilvington, 'Eylesbarrow (1814-1852): a Study of a Dartmoor Tin Mine' *Trans. Devon. Assoc.*, CVI (1974) pp161-214; T.A.P. Greeves, 'Wheal Prosper: a little known Dartmoor Tin Mine' *Plymouth Mineral and Mining Club Journal*, VI (1975) pp6-7; M. Atkinson, R. Burt and P. Waite, *Dartmoor Mines: the Mines of the Granite Mass*, (Exeter: 1978); P.M.G. Russell, 'Manganese Mining in Devon' *Devon and Cornwall Notes and Queries*, XXXI (1970) pp205-13; C.J. Schmitz, 'The Early Growth of the Devon Barytes Industry 1835-1875' *Trans. Devon. Assoc*., CVI (1974) pp59-76; C.J. Schmitz, 'The Development and Decline of the Devon Barytes Industry 1875-1958' *Trans. Devon. Assoc*., CIX (1977) pp117-33; A.K. Hamilton-Jenkin, *Mines of Devon*, Part I, 'The Southern Area' (Newton Abbot: 1974).

INTRODUCTION

The rocks of the Teign Valley are of Culm Measure (carboniferous) age, consisting of shales and mudstones of varying hardness together with localised cherts and tuffs. These strata have been extensively faulted and folded and there are numerous basic volcanic intrusions (greenstone and elvan). The presence of the nearby Dartmoor granite has resulted in some degree of metamorphism in the Culm rocks. Three distinct types of mineral deposits have been exploited in the area; impregnations of manganese in the cherts (associated with the basic intrusions), east-west striking quartz-iron lodes, and north-south striking barytic-lead lodes. The first two have been of limited commercial importance in this area, the north-south lode system being regarded as the primary one in the district. As a result of this, and contrary to usual practice in South-West England, the east-west iron lodes have been termed caunter (or contrary) lodes.

The main barytic-lead lode system consists of a series of fissures, either parallel or interlacing, which developed in a belt of weakness, extensively faulted, which runs around the eastern margin of the Dartmoor granite. Most of these fissures are mineralised; at Bridford mine there were at least six branches of the lode system with workable widths of barytes. At Aller mine the deep adit cut four branches, running parallel to the main system, all containing barytes and calcite together with small quantities of galena. However, the bulk of the lead, silver and zinc minerals produced in the valley came from two large lodes, roughly parallel, which have been traced from Wheal Adams, in the north, through Wheal Exmouth, Frank Mills and Hennock mines, to South Exmouth mine, in the south, where the whole system seems to have been cut off by a large fault.

Although the character of these two main lodes, usually designated East and West lodes, varied from mine to mine, they were generally from two to four feet wide, and brecciated. They contained a wide variety of minerals characteristic of a barytic-lead type deposit: galena, cerussite, spalerite, silver (associated with the galena), malachite, chalcopyrite, tetrahedrite, stibnite, limonite, iron pyrite, barytes, calcite, fluorspar and quartz. In addition, nickel and cobalt minerals have been noted in the Wheal Adams lodes. Occasionally, minute particles of magnesite, hemimorphite and calamine have been discovered, especially at Frank Mills.

Despite the wide range of minerals found in these lodes only seven have been raised and sold in significant quantities: lead ore (galena), zinc ore (blende), silver, iron ores (limonite and haematite), barytes and fluorspar. During the period 1845 to 1880, in which production statistics are available, the Teign Valley as a whole is recorded as producing 28,529 tons of lead ore (with a recorded lead content of 18,743 tons), 387,748 ozs. of silver, 2,076 tons of zinc ore, 422 tons of iron ore and

176 tons of fluorspar. Production of barytes at Bridford mine continued after 1880, with an output of about 16,000 tons by 1900 and a total of around 420,000 tons by its closure in 1958. These figures of lead and silver production ignore that coming from Wheal Adams and Hennock mines before 1845, when the official collecting of output data commenced. Assuming Wheal Adams produced around 100 tons of ore a year in the period 1828-41 and in 1844, and that Hennock produced 20-30 tons a year, 1812-18 and 1836-40, this adds another 1,800 tons of lead ore to the Valley's total. An unusual sale was that of 17 tons of copper ore (probably tetrahedrite) from Wheal Exmouth in 1859.

In addition to the above, some quantities of manganese were raised from the locality, in the form of pyrolusite, psilomelane and dialogite. Its seems that manganese was being raised from pits near the site of South Exmouth in 1816 and 1817. From 1829 to 1841, a total 2,460 tons of manganese ore was produced at a mine on the Canonteign estate, near Aller farm. In 1838 a sale of 70-100 tons is recorded from Hennock mine and between 1845 and 1865 odd parcels totalling 230 tons came from Hennock and Wheal Adams. Finally, 118 tons of manganese was produced in 1875 from a site called Riley mine, to the south of South Exmouth.

The chief lodes worked in the Teign Valley were:

Wheal Anna Maria and Lawrence - at the northern extremity of the Teign Valley mineralized belt. There were said to be seven east-west copper lodes in Wheal Lawrence but the only mineral produced was some lead in 1851. The lodes that produced this consisted of several leaders with an overall width of from 20 to 30 feet, coursing about E.32.S and containing quartz with sporadic patches of barytes, zinc-blende and galena. In Wheal Anna Maria the lodes, also leaders and coursing about E.32.S, with an overall width of 10 to 15 feet, contained quartz and iron pyrite, but no visible lead.

Birch Ellers - Here one main lode was worked, coursing about E.45.S and containing calcite, blende, fluorspar, abundant barytes and sporadic amounts of lead. It is said to have varied in width from 2 to 8 feet, averaging just under 4. About 600 feet to the east was another parallel lode, East lode, which contained mostly barytes.

Bridford Consols (in its last period of working 1875-1958, known as the **Bridford Barytes Mine**) - Numerous veins here, all roughly parallel and coursing about E.50.S, contained large quantities of barytes together with small amounts of blende, tetrahedrite, iron pyrite, galena and quartz. Small quantities of lead were produced before 1871. The veins varied in width from a few inches to over 40 feet, but the average was about, 6 feet.

Bennah - the lodes here consisted almost entirely of numerous parallel stringers of quartz and barytes with minute particles of galena and iron pyrites. They coursed about E.85.S and covered a zone about 400 feet in width.

Aller - four lodes, all coursing E.80.S, were cut and a fifth which varied between E.75.S and E.85.S. These lodes were largely [2] quartz and barytes filled, containing little lead or zinc, and were spaced at the following intervals: 162 feet, 60 feet, 84 feet and 54 feet.

Wheal Adams North Shaft Workings (also known as Reed Mine?) – worked on two lodes, the beginning of the East and West lodes of Exmouth and Frank Mills mines. The lodes coursed almost due north-south and contained quartz, zinc blende, pure white barytes and a few scattered galena crystals. The size or distance apart of the two lodes is not known.

Wheal Adams – Two lodes, coursing roughly north-south. The larger, East lode, averaged about 4 feet in width and contained argentiferous galena and blende. The western lode carried less silver-lead but considerably more blende, averaging about 2 feet in width. There was also a reported copper lode, said to lie to the west of West lode, although its exact position is not certain. Wheal Adams appears to have made some small sales of copper ore between 1845 and 1855 .

Wheal Exmouth – Two main lodes, underlying about 12 degrees east and 90 feet apart in the adit level but converging by the 72 fathom (fm) level. They both coursed almost due north-south and consisted of calcite, barytes, fluorspar, argentiferous galena and blende together with sporadic amounts of cerussite, malachite, chalcopyrite and tetrahedrite. A branch lode, underlying parallel to the main lodes, was largely barren, containing large quantities of quartz and barytes. On the mine plans this latter lode is usually marked as a 'flookan' (the common Cornish term for a barren cross-course or lode). Of the two main lodes, East lode was the more productive.

Frank Mills – Exploited the same two north-south coursing lodes as in Wheal Exmouth. However this mine contained more workable branch lodes. The underlie of the two main lodes varied considerably at different depths. At the 30 fm level they were 138 feet apart, where East lode had an underlie of 20 degrees west and West lode was nearly vertical. By the 85 fm level they were 90 feet apart and both changed their underlie, East lode to nearly vertical and West lode to 10 degrees east. They continued like this to the 130 fm level where they were only 48 feet apart. Below this they both ran with an underlie of 10 degrees east. Of the two lodes, unlike in Wheal Exmouth, West lode was the more productive. The only other significant lode, No.1 Branch lode, lies between the two main lodes, with an underlie nearly parallel to that of West lode. Both East and West lodes averaged about 2 to 4 feet in width but in places there were swellings of up to 30 feet. They both contained argentiferous galena, blende, barytes, calcite, quartz and fluorspar, with cerussite, siderite and limonite. Small amounts of stibnite (antimony ore) were also reported in the Frank Mills lodes. In its deeper levels the Frank Mills lodes were cut by a number of east-west striking iron lodes, from which some parcels of ore were sold in the 1870s.

Hennock - Although both lodes seem to have been present, only one was developed to any significant extent, the other being largely barren in this mine. At various times between 1836 and 1855 the main lode was described as from 4 to 10 feet wide. It seems to have consisted largely of quartz with a maximum width of about 1 foot of slightly argentiferous galena. In addition, there were quantities of cerussite and siderite in places.

[3]

South Exmouth - Working on two lodes, coursing north-south and parallel to each other. East lode, however, was of limited value and thus little exploited. At Westcomb's Engine Shaft the two lodes were nearly vertical but to the north, West lode assumed a slight westerly underlie. West lode, about 2 to 8 feet wide, consisted of quartz and argentiferous galena, with patches of zinc blende (usually of the blood red variety), odd spots of iron pyrite and chalcopyrite in the upper levels and massive barytes in the lower levels. The highest concentrations of lead were found above the 60 fm level.

At the southern end of the South Exmouth sett (a Cornish mining term which is no doubt a corruption of 'site'), just to the east of Hennock village, the entire north-south coursing barytic-lead lode system is suddenly cut off, seemingly by a large fault. The only minerals found in the valley to the south of this point were the manganese ores at Riley, associated with a basic volcanic intrusion into some cherts.

CHAPTER THREE

Expansion

A visitor to the Teign Valley in 1842 would have commented on the quiet agricultural life of the parishes of Hennock and Christow but would also have noted the presence of some small lead mines, worked a few years previously, but presently idle. Between 1840 and 1845 there was a minor setback in the price of pig lead; it fell from just under £19 a ton in 1841 to little more than £16 a ton in 1843. Another factor which may have contributed to the temporary recession in the mining industry in the valley was that, in 1841, John Williams of Scorrier died, at Calstock in Cornwall. Williams' close involvement in the Canonteign mining company had led to its rapid expansion in the later 1830s and no doubt his untimely death, coupled with the recession in metal prices, led to the mine being closed. It is also possible that the original lease on the site, taken out for a term of 21 years in 1820 or thereabouts, by the tributer Barrett, had not been renewed by Williams, and had expired. In any event it seems that after 1841 the surviving members of the Williams family took little interest in the Teign Valley. Thereafter, capital for the mines would have come from a wider field, including the expanding London-based mining share market.

The only spark of activity apparent during this period was in 1842 when the *Mining Journal*[1] mentioned a trial being made for lead near Hyner Farm. This is interesting because it is the first mention of any activity on the site of the future Frank Mills mine, which later became the deepest and most productive in the valley. On this occasion, however, nothing seems to have resulted from the prospecting activity.

In 1841 the owner of Reed Farm, on which was situated the Williams lead mine, was Nathaniel Addems.[2] Soon after the mining company suspended operations, it seems that Addems died. His widow, Ann Addems probably deciding that she was unable to maintain the farm on her own, decided to sell it. Accordingly, the following advertisement appeared in the *Mining Journal* of the 1st July 1844:

TO MINERS AND OTHERS – Auction at the Clifford Arms, Chudleigh, Thursday 13th July of the Estate or Farm called Rood or Reed, in the parish of Christow, owned by Mrs. Ann Addems. Lead Ore of a superior quality has lately been found on the estate, and there is every prospect of the capability of Mines being worked thereon with great pecuniary advantage.

The purchasers were John and James Hamlyn of Bennah Farm, to the north of Reed. Once in ownership they lost no time in arranging

leases with prospective mining companies. One company was formed to work the old Canonteign mine under the name of Wheal Adams, most likely taking its title from the original owner of the land. Another enterprise, taking the name East Wheal Friendship, set out to work the area to the north of Wheal Adams, on the land abandoned by John Williams' mining company in 1841. In later years the *Mining Journal* complained about the circumstances which surrounded the establishment of the Wheal Adams company.[3] At first the *Mining Journal* maintained that 'Wheal Adams shares were offered to several parties in Exeter for a mere trifle, but no purchasers were found, consequently, the Londoners hold the chief part of the mine .. ' Subsequently the paper attempted to explain the manner in which the company had been established and perhaps counter feelings in Exeter and district that a cloak of secrecy had surrounded these events: 'There were no advertisements of (this company) .. and every share was taken and subscribed for almost before the plans were matured and the leases signed. This speaks volumes for a district comparatively new.' By the time this piece appeared (1852) Wheal Adams had certainly established itself as a profitable mine and so it was perhaps simple for the *Mining Journal* correspondent to read a little too much significance into the speed with which shares were taken up in what was still, then, a largely unproved mining district.

Meanwhile work was proceeding on the task of putting the mine back into running order after it had lain idle for the previous three years. The new company, with its London-based shareholders, seems to have had no lack of finance for the task. This was in contrast to most other earlier workings in the valley. So, given the fortune of good mineral deposits, from the outset Wheal Adams proved a first-class investment. The activity and optimism of the early days of the company were summed up by the *Mining Journal*: 'Strong expectations are entertained in the neighbourhood as to the results of the recent discoveries of mineral wealth, in the parish of Christow, whence great additional employment is anticipated for the labourer, and a handsome return to the adventurers with proportionate dues to the lord of the soil'.[4] So, nobody was being forgotten in the anticipated share-out of the mineral wealth that lay under the fields of the Teign Valley. The general optimism of the moment spread to the company working the sett to the north, East Wheal Friendship and, to start with, the level of activity seems to have been similar to that at Wheal Adams. The *Mining Journal* commented on these operations on the northern extension of the Adams lodes:

Sets have also been recently taken on property situated in the parish of Christow belonging to Messrs. Hamlyn, on the most liberal terms. Every disposition to meet the views of the adventurers has been shown by the owners of the ground; a lease of 21 years has been granted, and every possible facility has been granted to the lessees since the commencement of operations. Several experienced tributers, who have been engaged in some of the best mining speculations in Cornwall have for

reported that they have the fullest confidence in the successful results of the labours already commenced. East Wheal Friendship is the name of the new set. Miners have been employed since the granting of the set, who have worked on the back of the lode and are now in course of bringing up a new adit. – PLYMOUTH JOURNAL.[5]

A further optimistic report appeared in the *Mining Journal* in November 1844: 'On a continuation of the same lode (as Wheal Adams), a sett, named East Wheal Friendship has been taken up by some spirited adventurers, who have driven an adit and cut a lode from 5 to 6 feet wide, and sufficiently promising to warrant arrangements being made to erect a 40 inch cylinder engine, to prove the lodes, which will meet at a certain depth.' The general optimism of the mine adventurers in the district was then summed up: 'Experienced miners who have been engaged on the several workings declare, that on capitalists becoming acquainted with this district, this part of Devonshire will soon display as active mining operations as the county of Cornwall.'[6] The early optimism concerning East Wheal Friendship seems to have been ill-founded. The lodes there were clearly never as productive as those directly to the south, at Wheal Adams and Exmouth, and there is no evidence that the 40 inch steam engine was ever erected.

Having commenced operations in 1844, Wheal Adams' first recorded output, of 59 tons of lead ore in 1845, was published in the *Mineral Statistics* for that year.[7] From 1845 onwards, allowing for some of the inevitable deficiencies in the data published (in the early years mining companies provided output statistics on a voluntary basis) the *Mineral Statistics* do give a much better indication of the growth of mining activity and mineral production in the valley. Wheal Adams' lead output of 59 tons in 1845 probably represented the total amount produced in the valley (as it was until 1851). East Wheal Friendship remained absent from the list of lead producers in Devon and, with no mention of the company in the *Mining Journal* after November 1844, it is clear that the adventurers were finally discovering the poverty of the lodes there. In contrast, with a steadily increasing level of activity, regular reports on Wheal Adams commenced in the *Mining Journal* from October 1846 onwards.

In these reports the manager, Captain James Moyle, gives a clear picture of the condition that the old mine was in when his company took over in 1844. The new engine shaft had already been sunk to a depth of 50 fathoms, replacing the old engine shaft. The method of working the old mine, already deep by Teign Valley standards of that time, was nevertheless rudimentary. There had been no rails, or tramways, laid in the underground levels; all carting of ore below surface was done with antiquated hand-barrows. There was also no winding engine beyond a rather inefficient horse-whim which hoisted the ore to grass. Despite these initial difficulties work seems to have proceeded at a fair pace and in the *Mining Journal* of October 1846 Captain Moyle made the following report:

WHEAL ADAMS. I beg to hand you my report of the above mine; the 50 fm level, driving south, is much the same as last reported. We have not cut the lead lode yet, but we have a lot of water coming from the end, which is very strong. This is a very good sign that the lode is before us. In the 40 fm level, driving south, the lode is 4 ft. wide, with good stones of lead in it - all saving work. The rise in the back of the 40 fm level, on the silver-lead lode, is much the same as when last reported, say, worth £15 per fm. The winze sinking under the 28 fm level, much the same as last reported, worth £10. We do expect to get this winze through this week, if all be well. The tributers, I think, most of them, are getting wages. I set another tribute pitch today, on the eastern lead lode, of 12s. in the £. - J. Moyle, Christow, Oct. 19.'[8]

Two or three points in this report might be explained. The term 'saving work' means covering costs. The fact that the tributers, working for a previously-agreed proportion of the value of the ores raised by them, were 'getting wages' suggests that Captain Moyle considered that the value of the ore being worked had been maintained since the last setting day, at which the proportion had been fixed. The tribute pitch set at 12 shillings in the pound (value of ore raised) would seem to indicate a rather middling to poor value of ore; a richer lode would have produced a tributer's 'bargain' of perhaps 6 or 7 shillings in the pound, or even as low as 3 or 4 shillings.

Later reports during 1846 indicated that the 50 fm Level was continued, driving south, and that the 40 fm level was continued driving on the western silver-lead lode. At the time these two levels seem to have been the main working ones; work at higher levels, in the 8 fm., 18 fm and 28 fm, was eventually abandoned. During November and December 1846 there were numerous reports which seem to indicate that some good mineral deposits had been located. In one, heavy zinc blende deposits were reported in the 50 fm drive south.[9] A short while later it was reported that a cross-cut was being driven west on the 28 fm level to intersect a copper lode, supposed to lie 30 fms west of the starting point.[10] There was, however, no further report of this copper lode. The rich nature of the lodes at Wheal Adams was illustrated by another report, in December 1846. In this the 50 fm level was reported as worth £7 a fathom driving south on the east lode, and worth £5 a fathom driving south on the west silver-lead lode. The reported output for 1846, 33 tons of lead ore,[11] was probably less than for 1845 due to greater effort being put into exploration and development activity underground. At the end of December James Moyle was replaced as mine captain by John Prince. Moyle then appears to have been connected with a number of unsuccessful mining enterprises near Okehampton and Drewsteignton[12] and according to Ramsden, seems to have been something of an opportunist.[13] This, however, is a label that might be fixed to the majority of nineteenth-century mining men, successful or unsuccessful. After Moyle's departure, Wheal Adams appears to have been very competently managed by Prince.

Early in January 1847, 10 tons of lead ore and 60 tons of zinc blende were ready for sale. By early February a further 90 tons of blende was ready for dispatch. At this time it seems that zinc ore was more abundant in the mine than lead. However, there were occasional rich patches of lead found in the lodes and during 1847 the reported values per fathom ranged from £5 to £12, averaging about £8 per fathom. At the drive headings there were constant, heavy streams of water being emitted and these were held by the miners to indicate good deposits ahead – this spurring them on in their efforts. By the end of February it was reported that some tributers were sinking a shaft in the lower orchard at Reed Farm and were already 6 fms from surface, and had found lead and zinc. This later became known as Adams North Shaft (among other names). However, the deposits in this part of the sett were never as rich as to the south and so the workings from this shaft were not developed to any great extent, although some time subsequently the shaft appears to have been deepened, with unknown results, to make a further trial of the lodes at this point.

At the end of March the general mood at Wheal Adams was very optimistic. New Engine Shaft had been sunk a further 10 fathoms and drives commenced at the 60 fm level. The water in the 50 fm end, south, was increasing and with it the hopes of the miners and adventurers. The 60 fm was being driven southwards, hurriedly, in order to facilitate the unwatering of the 50 fm., above. It was noted, in passing, that the ground in the 60 was rather soft. As it happened, this was to be a portent of troubles to come. This great activity continued into April; the 28 north of Old Engine Shaft was being cleared and a larger pump being installed in order to deal with the greater volumes of water in the deeper levels.

Suddenly, amidst all this activity, a minor disaster struck the company. On the 27th April, there was a heavy fall of ground between the 40 fm and 60 fm levels, in the vicinity of New Engine Shaft.[14] This collapse ruined the new pumps which had just been installed and rendered the shaft temporarily useless. New Engine Shaft had been first sunk in the late 1830s, primarily to by-pass Old Engine Shaft, which had presented problems of running ground, and had required constant, heavy timbering. So, after New Engine Shaft collapsed in the spring of 1847 the company had to resign itself to the fact that this shaft would also require timbering. They also had to purchase another set of pumps to replace those lost in the accident. All this unforeseen expense and delay must have sorely tried the company and the fact that these problems were weathered stands as testimony to the fairly secure position of the mine. However, since the miners had been unsuccessful in yet locating the expected large lode, despite the strong streams of water in the ends, the news of the accident helped depress the value of the company's shares for a brief period; they fell from £30 quoted for a £40-paid share, to £10. All in all, the costs of the fall had been slight - there was no loss of life since the collapse apparently took place at night, when few men were underground. Within a few months the shaft was secured and in use again.

By the 1st August 1847, a winding engine had been purchased and erected on New Engine Shaft and the timbering was nearing

CHAPTER FOUR

Prosperity

The age of prosperity was ushered in, rather oddly, with the failure of the ailing Hennock company. Also failing at the same time was the Birch Ellers mine, in the north of the Teign Valley, near the village of Bridford. Ramsden[1] believed that the two mines were under the same management. In addition to this possible connection, a writer in the *Mining Journal* commented that both workings were equally badly sited.[2] Birch Ellers was probably at a greater disadvantage, being about 11 miles from the nearest port, Newton Abbot, with a correspondingly higher cost for the haulage of materials.

The northernmost part of the Teign Valley lode system was never very productive of lead ore. The two most significant mines working on it, during the early 1850s, were Birch Ellers and Bridford Consols. There had been attempts to locate lead deposits in Bridford parish as early as 1835, when the local vicar, the Rev. Carrington, noted in his diary (now a MS in the Exeter City Records Office) that there was great activity by miners in the vicinity of Stone, Southwood and Venn farms, sites close to the later workings of Bridford mine. This search was, however, without any apparent success. In 1847 there was another short-lived attempt in the same locality, when the 'Wheal Ann Copper, Tin and Silver-Lead Mining Company' commenced operations. With hindsight this title suggests either great optimism or stupidity on the part of the promoters, since this combination of minerals is rarely, if ever, found in conjunction. After some months of spirited activity, according to the *Mining Journal*, looking for ' .. the great lead lode, which runs through this set about half a mile to the north of the great barytes lode .. ' operations seem to have ceased without locating the sought-for deposits. As with later attempts, the Wheal Ann adventurers had only succeeded in proving the presence of fairly abundant barytes in their lodes.

In September 1849 another company was registered, under the name 'Bridford Wheal Augusta', to take over more or less the same sett. By mid-1850 the name had been changed to 'Bridford Consols', with a controlling interest apparently being held by the proprietors of Wheal Adams. A further link with the latter company was developed, from June 1852, with the appointment of Captain Martyn (formerly of Wheal Adams and Exmouth) as agent, at a salary of £2.2s.0d. per month.

To the north of Bridford, operations at Birch Ellers mine had commenced in the autumn of 1850, although evidence in the *Mining Journal* suggests there was little achieved there until 1853. The agent at Birch Ellers was Captain George Odgers of Camborne who, in his native Cornwall, had worked in a number of

tin and copper mines including the celebrated Levant mine, at St Just. In the years 1851-54 there were numerous reports in the *Mining Journal* on the activities of both Bridford and Birch Ellers mines, suggesting great activity in the search for lead. The only mineral found in any quantity, however, was the ever present barytes, for which there was only a limited market at the time. Later in the nineteenth century it came to be used in a range of paints as a pigment and filler. At Bridford Consols, by 1855, a vein of barytes had been identified, nearly 300 feet in depth, about 600 feet long from north to south, and averaging about 40 feet in width. Due to limited demand, sales were minimal; in 1855 it is recorded that 35 tons was sold.

The lack of success in locating lead ore deposits of any significance resulted in the suspension of operations at both mines by the end of 1855. Reaching a maximum depth of 50 fms from surface, Birch Ellers managed a sale of 13t tons of lead ore and 126 oz. of silver in 1854, followed by 12 tons of lead ore in 1855 (the total value of sales in these two years being £370).[3] In the *Mining Journal* of 29th September 1855 a sale notice appeared in which the materials at Birch Ellers were offered, including a 30 inch cylinder (8 foot stroke) steam engine, a 30 foot waterwheel and an 8 ton boiler. At Bridford the desperate search had taken the main shaft down to 35 fms. below adit, drained by a 40 inch, Loam designed, engine, by the summer of 1855. This was in vain, however, and by early September 1855 operations there had also come to an end.[4] Bridford mine, unlike Birch Ellers, was destined to come back to life again and by 1875, with a growing industrial demand for barytes, operations recommenced and continued until the summer of 1958. By then, with workings up to 600 feet from surface, a total of around 420,000 tons of barytes had been produced in 83 years' continuous operation. (A fuller account of barytes production at Bridford mine is contained in two articles by the author; see footnote 3 to this chapter.)

Since 1853 there had been a steady level of activity at Frank Mills, sinking the shaft and making preparations for the installation of a pumping engine. By January 1855 the shaft had been sunk to the 30 fm. level and a 60 inch cylinder engine erected. At the 30 fm. level a cross-cut had been driven 16 fms west towards the lode. The signs appeared good; in the words of 'a miner', 'in a geological point of view, I consider this to be a most promising piece of mineral ground'.[5] The company must have been fairly confident of taking the shaft to some depth in order to erect a pumping engine as large as a 60 inch. At this time, with workings down to just 30 fms and of little lateral extent, there was no immediate justification for an engine of this size. The engine had been ordered from the Perran Foundry, in Cornwall, towards the end of 1854, while the building to house it was being constructed in the same ornamented style as that housing the 70 inch engine on Porter's Shaft of Wheal Exmouth.

From its commencement Frank Mills was worked in close conjunction with Wheal Exmouth. At first the new mine was managed by May and Bidwell, the Exmouth pursers, while the first

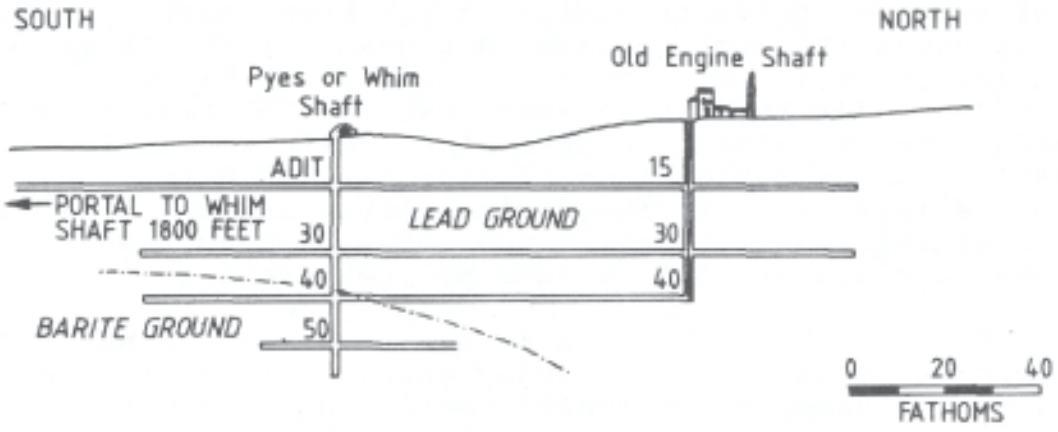


FIG 4 - SECTION OF BIRCH ELLERS MINE, c. 1855

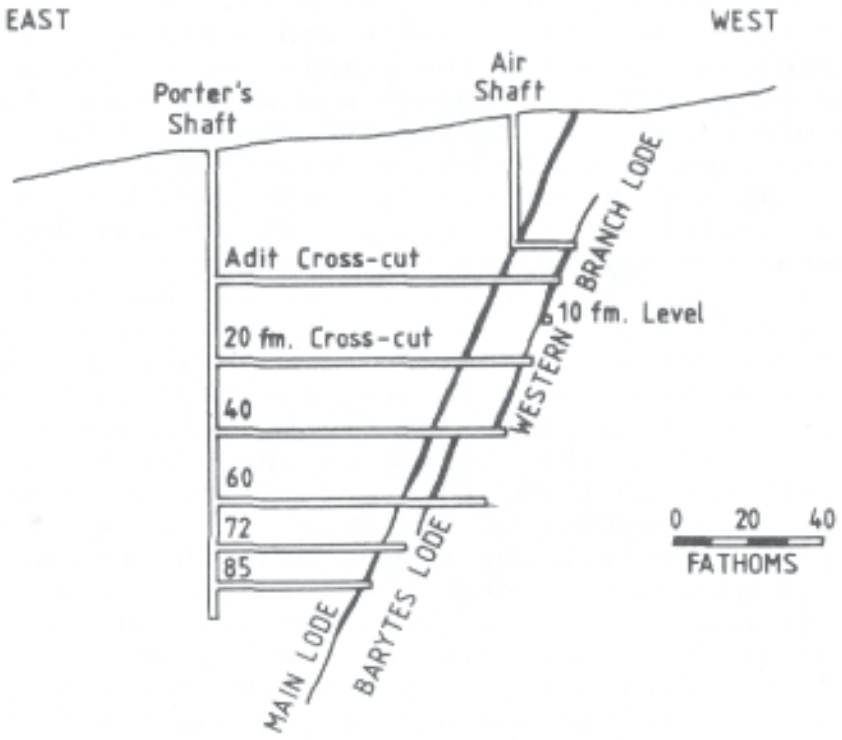


FIG 5 - CROSS SECTION OF WHEAL EXMOUTH, 1860

mine captain was J.P. Nicholls, who had for a short time been an underground captain at Wheal Exmouth. Also, until a mill could be constructed adjacent to the engine shaft at Frank Mills, all the ores produced were sent to Wheal Exmouth for crushing and concentration. This fact alone accounts for the lack of separate production figures for Frank Mills until 1857, although it seems certain that quantities of lead ore were being produced from at least the end of 1855.

By June 1855 the engine shaft was down 45 fms from surface. During the following months, while the engine shaft was still sinking, attempts were made at the 30 fm level to locate the lode. In a drive north on that level a lode was cut containing quartz, barytes and spots of lead. On the 1st September Captain Nicholls made a progress report:[6]

> **FRANK MILLS**:- The lode in the 45 end south has improved much since yesterday morning; there is now a branch near the footwall, containing good work, which we are saving. In the 45 north the lode is not so good as when reported on last, yet we are still getting some good work from this end. The engine shaft is sinking very favourably. The east lode is without any material alteration since last report. - J.P. Nicholls.

As this underground development was proceeding there was also an effort made to complete the construction of the major surface installations. With increasing output of lead ore, particularly from the 45 fm. level drives north and south on the west lode, there was pressing need for the completion of the mill at Frank Mills. The mill at Wheal Exmouth would obviously have been under some pressure, considering the rapid growth of lead ore output at the time from its own underground workings. On the 18th October 1855 Captain Nicholls reported that work was under way in constructing all the dressing floors and ponds that would be necessary for the anticipated growth of output in future years. These floors were to be set out to the west of the engine shaft, adjacent to the mine offices.

During October the 45 fm level was further developed to reveal some improved grades of ore, and Captain Nicholls felt justified in reporting that 'there are some more branches of the east lode come in the shaft from the east side, with some fine cubes of lead in them; this lode will, in my opinion, be found to open rich in the 60 fm. level'.[7] At the same time some difficulties were being experienced in sinking the shaft: 'the shaft is at present very troublesome for sinking, although the ground is not hard, it is very wet and bad for blasting'.[8] Notwithstanding these problems, by the beginning of December it was down 60 fms from surface, and by the new year drives had been commenced north and south from the shaft bottom. By January 1856 it was confirmed that the 60 fm level was cutting some rich ore-bodies. In the first *Mining Journal* of the year it was reported that the lode at the bottom of the shaft was worth 2½ tons per fathom in the drive south.[9] In response to these preliminary results the company set an extra 'pare' of tributers, driving at a fast rate, to further explore

this level.[10] Through the rest of the year this level probably produced most of the lead ore coming from Frank Mills. Although, as already stated, there are no separate production figures for Frank Mills in 1856, Ramsden estimated that this must have been of the order of 200-250 tons (and included in the Wheal Exmouth total for that year).[11]

By August, a water-wheel had started working, providing power for the first sections of the mill to come into operation. A couple of weeks later it was reported[12] that the engine shaft was completed to the 72 fm. level. It would therefore seem that the problems caused by wet ground inhibiting blasting had been overcome. Also completed, a short time later, was' an air shaft, just to the south of the pond on the Canonteign estate. Until this was completed, with only one shaft connecting to the underground workings, the mine had suffered from a lack of good ventilation. With the holing of this air shaft into the 45 drive north, a through draught was obtained and the mine never really suffered from the same problem again. By November the east lode had been cut in the 72 fm. level, from a crosscut. In the process, it was confirmed that this lode showed as much promise as it was in the 60 fm. level, above. The opening up of the Frank Mills lodes during 1856 certainly seemed to indicate a valuable mining property.

Eighteen fifty-five and six were also favourable years for the Wheal Exmouth adventurers. The following optimistic report appeared in the *Mining Journal* during January 1855:[13]

> At **WHEAL EXMOUTH & ADAMS**, operations are progressing most favourably. The whim-engine is nearly completed, and a communication from Porter's cross-cut to the adit level, which is a great boon for the working miner. New floors are, I hear, to be laid out at Porter's Shaft, and I have no doubt but that the mine will this year pay something good in the shape of dividends.
> - MINER. Exeter, January 9th.

The new floors were necessitated by the increasing output, which had reached 1,140 tons the previous year and was still rising. An interesting point about the above report is that it purported to be written by a 'miner'. It seems more likely, however, that the forecast of high profits came from a member, or members, of the committee of management, probably Messrs. May and Bidwell.

A more solid statement of the company's finances was given in a summary of the quarterly accounts, announced at a meeting held on the mine on the 9th August 1855, with Mr Porter in the chair:[14]

	£.	s.	d.
Balance last meeting:	1934	8	0
Less dividend:	427	10	0
Ore sold:	2524	7	6
Sundry expenses:	183	5	10
Balance after costs:	1168	12	11

Commenting on these figures, the chairman noted that the receipts from ores sold was the highest to date, and highly satisfying. Captain Hampton was then directed to prepare an inventory of the machinery and materials remaining at Wheal Adams, distinguishing between what might be usefully retained for the working of Wheal Exmouth and that which could be disposed of. The policy of abandoning the older mine was therefore drawing towards its conclusion. The Wheal Adams shafts, particularly Williams' Shaft, would be necessary for some time, for ventilation and access to the Exmouth levels and so some essential maintenance had to be continued for the time being. Eventually, the Exmouth shareholders hoped they would be able to close the Wheal Adams section completely, with the completion of Porter's Shaft to the deepest levels of their mine.

During August and September there were some favourable reports on deposits throughout the Wheal Exmouth sett; values of the lodes in the different levels varying between ¼ and 2½ tons per fathom. Porter's Shaft continued to sink in good ground and by November 10th was reported down 51 fms from the surface. During September it was stated that there was ' .. on the mine, undressed, from 80 tons to 90 tons (of lead ore) which would have been dressed but for lack of water'.[15] Soon after, a new pond was constructed to store water over dry periods for dressing purposes; on December 8th it was reported that ' .. we get a full supply of water from our pond every day'.[16] In conjunction with the expansion of the dressing floors, a new ore linhay (store) was erected near the 70 inch engine house and by December 15th it was stated that the overflow of ore from the floors had necessitated using it earlier than planned.[17]

One of the most interesting reports of the year came in September 1855, when it was estimated that there was a full 6,000 tons of lead ore available in the mine, equivalent to 3½ years' reserves for the mill at the current rate of production of 150 tons a month.[18] The years' output, when finally known, of 1,285 tons of lead ore and 18,630 oz. of silver, was equally satisfying to the shareholders.

Early in February 1856 preparations were being made to take up the pitwork from Wheal Adams engine shaft. It had already been decided that Williams' Shaft would be maintained in a working state for some time as it was still essential to the working of Wheal Exmouth. By the end of April the work of stripping the unwanted plant from Wheal Adams had been completed and such items as were required for Wheal Exmouth had been hauled over to Porter's Shaft. In the end it seems that little plant was actually sold off, most items being used by the company.

The speed of sinking Porter's Shaft had improved, meanwhile, and by mid-May it was announced that it was down 85 fms from surface (down to the 60 fm. level below adit). At the 20 fm level below adit a cross-cut had been driven 130 fms and at the 40, a cross-cut driven 60 fms, both levels making contact with the workings on the main lode. So, at last, full use could be made of Porter's Shaft in the working of the mine. From June 1856, as well as continuing to sink below the 60 fm level below adit, the shaft had to cope with hauling the ore to surface and